

APPLICATION FOR UNITED STATES LETTERS PATENT

TITLE: DEPOSIT ACCEPTING
METHOD AND APPARATUS
FOR AUTOMATED BANKING
MACHINE

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DOCKET NO.: D-1130 R3

TECHNICAL FIELD

This invention relates to automated banking machines. Specifically this invention relates to devices and systems which receive deposits of individual sheets such as checks and other instruments, as well as items such as envelopes, into an automated banking machine.

BACKGROUND ART

Automated banking machines are known in the prior art. Automated banking machines are commonly used to carry out transactions such as dispensing cash, checking account balances, paying bills and/or receiving deposits from users. Other types of automated banking machines may be used to purchase tickets, to issue coupons, to present checks, to print scrip and/or to carry out other functions either for a consumer or a service provider. For purposes of this description any device which is used for carrying out transactions involving transfers of value shall be referred to as an automated banking machine.

Automated banking machines often have the capability of accepting deposits from users. Such deposits may include items such as envelopes containing checks, credit slips, currency, coin or other items of value. Mechanisms have been developed for receiving such items from the user and transporting them into a secure compartment within the banking machine. Periodically a service provider may access the interior of the machine and remove the deposited items. The content and/or value of the deposited items are verified so that a credit may be properly applied to an account of the user or other entity on whose behalf the deposit has been made. Such depositories often include printing devices which are capable of printing identifying information on the deposited item. This identifying information enables the source of the item to be tracked

and credit for the item correlated with the proper account after the item is removed from the machine.

Many automated banking machines accept deposits from users in envelopes. Because the contents of the envelope is not verified at the time of deposit, the user's account cannot be credited for the deposit until the envelope is retrieved from the machine and the contents thereof verified. Often this must be done by persons who work for a financial institution. Delays in crediting a user's account may be experienced due to delays in removing deposits from machines, as well as the time it takes to review deposited items and enter appropriate credits. If the deposited items include instruments such as checks, further delays may be experienced. This is because after the instruments are removed from the machine they must be presented for payment to the appropriate institution. If the instrument is not honored or invalid the depositing customer's account cannot be credited for the deposit. Alternatively in situations where a credit has been made for a deposited instrument that is subsequently dishonored, the user's account must be charged the amount of the credit previously given. In addition the user commonly incurs a "bad check" fee due to the cost associated with the institution having to handle a dishonored deposit. All of these complications may result in delays and inconvenience to the user.

Another risk associated with conventional depositories in automated banking machines is that deposited items may be misappropriated. Because deposited checks and other instruments are not cancelled at the time of receipt by the automated banking machine, they may be stolen from the machine and cashed by unauthorized persons. Criminals may attempt to break into the machine to obtain the items that have been stored in the depository. Alternatively persons responsible for transporting items from the machine or persons responsible for verifying the

items may misappropriate deposited instruments and currency. Alternatively the handling required for transporting and verifying the contents of deposits may result in deposited instruments being lost. Such circumstances can result in the user not receiving proper credit for deposited items.

5. To reduce many of the drawbacks associated with conventional depositories which receive deposits in the form of envelopes or other items, automated devices that can read and cancel deposited instruments have been developed. An example of such a device is shown in U.S. Patent No. 5,540,425 which is owned by a wholly owned subsidiary of the Assignee of the present invention. Such devices are capable of reading the coding on checks or other deposited
10 items. For example bank checks include magnetic ink coding commonly referred to as "micr". The micr coding on a check can be used to identify the institution upon which the check is drawn. The coding also identifies the account number of the user and the check number. This coding commonly appears in one or several areas on the instrument. Reading this coding in the automated banking machine enables the machine operator to determine the source of checks or
15 other instruments that have been presented.

Imaging devices may also be used in processing instruments. Such imaging devices may be used to produce data corresponding to an image of the item that has been deposited. This image may be reviewed to determine the nature of the deposited item, and along with the information that can be obtained from the coding on the instrument allows processing of the
20 credit to the user much more readily. Automated instrument processing systems also may provide the capability of printing an indication that the check or other instrument has been

deposited and cancelled after it has been received. This reduces the risk that the instrument will subsequently be misappropriated and cashed by unauthorized persons.

While automated deposit accepting and processing devices provide many advantages and benefits, existing devices also have drawbacks. One drawback is that instruments must be precisely aligned for purposes of reading micr coding or other indicia which is included on the instrument. This commonly requires special mechanisms to precisely position and align the instrument with the reading devices included in the device. A further drawback associated with some existing devices is that they are required to turn and reorient the deposited instrument. The mechanisms for doing this can be complex. Such complex mechanisms may encounter reliability problems due to the precise tolerances that must be maintained. Further difficulty is added by the fact that instruments that are received may be creased, torn or soiled. Handling such items may be difficult. Instruments becoming jammed in such mechanisms may result in costly repairs and downtime.

A further drawback associated with imaging systems in automated banking machines is that it is often not practical to transmit an image of a deposited instrument for review and analysis at the time it is received. This is because the time and bandwidth necessary to capture and transmit an image of the deposited instrument may be longer than desirable. Extended transaction times may discourage the use of the machine. A further drawback is that even when images may be transmitted sufficiently quickly, the operator of the system is required to invest in the resources necessary to analyze the transmitted image and make a determination as to whether the deposited item should be accepted as valid or not. Such capabilities may include employees who must review the image and determine whether the item is genuine by comparison to data or

other information such as examples of the customer's signature. Alternatively automated systems may be provided for analyzing the image of the instrument or the data printed or typed thereon. Providing such capabilities may be costly for the systems operator. Advances in photocopy technology also may make it difficult for operators of such systems to distinguish between genuine items and reproductions. As a result even with carefully operated and administered systems there is a risk that deposited items which are not genuine may be accepted.

Certain standardized techniques have been developed for automated banking machine systems. The electronic message flows and formats commonly used for ATMs for example do not include the capability of transmitting a document image as part of the standard message which requests that a deposit transaction be authorized. As a result it has been difficult to achieve real time check verification and cashing in widely distributed systems.

A further drawback associated with existing automated banking machine systems is that operators of such systems commonly wish to retain the capability to accept deposits in the form of items such as envelopes as well as checks and other instruments. Providing two separate depositories adds considerable cost and complexity to the machine. While mechanisms which can accept both single sheet-like instruments as well as envelopes have been developed, such mechanisms are often complex and unreliable. The capability of accepting both types of deposits is difficult to achieve because deposited instruments and envelopes may have varying thicknesses. The thickness of deposited envelopes may also be nonuniform. This is particularly true when such deposited envelopes may include items such as folded sheets or coin. Such combined depositories may also suffer from having lower security capabilities than mechanisms which are designed to accept only one type of deposit.

There is also often a desire to accept other types of documents in automated banking machines. Such documents may include for example utility bills or other items or instruments associated with value, or a particular account with which the customer may associate value or a particular payment. Such instruments may have thicknesses and properties which correspond to
5 neither conventional checks or deposit envelopes. In addition the two-dimensional size of such items may also vary. This presents challenges for reliably handling such items. It may also be desirable in some circumstances to be able to image items and instruments which are associated with a customer. For example in some circumstances it may be desirable to receive a customer's driver's license, social security card, immigration card or other document to verify the identity of
10 the user. Current depository mechanisms do not have the capability of reliably handling or imaging such items.

Thus there exists a need for a deposit accepting apparatus and system for use in connection with automated banking machines that has the capability of handling and imaging more types of items, which may do so more reliably and which can be used in connection with
15 more types of transactions and systems.

OBJECTS OF INVENTION

It is an object of an exemplary embodiment of the present invention to provide a deposit accepting apparatus.

It is a further object of an exemplary embodiment of the present invention to provide a
20 deposit accepting apparatus for use in connection with an automated banking machine.

It is a further object of an exemplary embodiment of the present invention to provide a deposit accepting apparatus which can be used to accept, image and verify the authenticity of items.

5 It is a further object of an exemplary embodiment of the present invention to provide a deposit accepting apparatus that accepts both sheets and envelopes.

It is a further object of an exemplary embodiment of the present invention to provide a deposit accepting apparatus that can be used in existing automated banking machine systems.

It is a further object of an exemplary embodiment of the present invention to provide a deposit accepting apparatus that has greater reliability.

10 It is a further object of an exemplary embodiment of the present invention to provide a deposit accepting apparatus that is more compact.

It is a further object of an exemplary embodiment of the present invention to provide methods of accepting deposited items.

15 It is a further object of an exemplary embodiment of the present invention to provide a method for verifying the authenticity of deposited items.

It is a further object of an exemplary embodiment of the present invention to provide a method for handling and storing deposited items.

Further objects of an exemplary embodiment of the present invention will be made apparent in the following Best Modes For Carrying Out Invention and the appended claims.

20 The foregoing objects are accomplished in an exemplary embodiment of the present invention by a deposit accepting apparatus and method used in connection with an automated banking machine. The deposit accepting apparatus includes a transport section. The transport

section includes a variable width transport which accepts items of variable thickness. Such items may include relatively thin single sheet-like items and relatively thick irregular shaped items such as deposit envelopes. The transport section includes a biasing mechanism for reliably engaging deposited items with moving mechanisms such as belts or rollers in the transport section. The deposited items are reliably engaged with such moving members to assure that the deposited item is moved through the transport section.

The transport section further includes a variable force driving section. The variable force driving section engages deposited items. The variable force driving section enables limited slip engagement with a deposited item as it is being accepted into the transport section. This enables a user presenting a document to avoid damaging or tearing a document if they fail to release it when it is first engaged by the variable force transport section. Once a document or other deposited item is sensed as having been moved sufficiently into the transport, the apparatus operates to cause the variable force transport section to engage the item more positively and in a nonslip fashion for purposes of moving it in the transport. In embodiments of the invention an aligning device may work in conjunction with the variable slip drive to aid in aligning documents with a transport path.

The transport section further includes an analysis module adjacent thereto. In the exemplary embodiment the analysis module is operative to analyze documents passing through the transport section. In the exemplary embodiment the analysis module is operative to enable the generation of data representative of an image of the document. In addition the analysis module is operative to sense for features and characteristics of the document which may be used to identify the document type. Alternatively or in addition the analysis module may operate to

sense properties of a deposited document which distinguish acceptable or genuine documents from unacceptable documents.

In the exemplary embodiment the transport section of the deposit accepting apparatus is connected to a deposit holding module. The deposit holding module includes at least two compartments therein. In the exemplary embodiment the deposit holding module operates to move the compartments relative to the transport section and to selectively place an outlet from the transport section in communication with a desired one of the compartments. For example when an envelope type deposit is accepted in the transport section, the deposit holding module operates so that the envelope is moved through the transport and deposited into a compartment which is adapted for holding envelopes. Alternatively when a check or other sheet-like deposit is moved through the transport section, the deposit holding module operates so that the sheet moves from the transport section into a compartment which is designated for holding the particular type of sheet.

In an exemplary embodiment of the invention described herein, a deposit accepting apparatus and method is used in connection with an ATM. The ATM includes one or more computers therein which operate to control the transaction function devices within the ATM including aspects of the deposit accepting apparatus. When a customer at the ATM wishes to deposit an envelope or similar deposit containing item in the machine, the controller enables the customer to place the deposited envelope in the machine so that it may engage the transport section. The computer also operates so that the deposit holding module places the compartment for holding deposited envelopes in communication with the transport section. The user is enabled to engage the deposit envelope with the variable force driving section which the

computer causes to operate in a limited slip mode. Once the computer senses that the deposit envelope has been moved into the transport section the variable force driving section may be controlled so that the envelope is more positively engaged with the moving members in the transport. The deposit envelope is then moved through the transport past the analysis module.

5 In the exemplary embodiment as the deposit envelope passes through the transport section the computer causes a printing mechanism to print identifying information on the envelope. The exemplary embodiment of the invention includes a printing mechanism which senses that the envelope has moved into proximity with the printing mechanism. In response to sensing this condition the computer causes the printing mechanism to move relative to the
10 envelope so that printing may be reliably conducted thereon. The movement of the printing mechanism provides greater assurance that the envelope will not catch on or be damaged by the printer mechanism. Once printing has been conducted the computer causes the printing mechanism to be returned to a standby condition.

15 Upon passing through the transport section the deposited envelope passes into the designated compartment. The entrance to the designated compartment is aligned with the outlet from the transport section through operation of the deposit holding module. Once the deposited envelope has passed into the compartment within the module it is held therein until accessed by authorized personnel. Suitable locking mechanisms and security procedures are provided so that only authorized personnel are enabled to access the deposit. The identifying information that is
20 printed on the envelope enables the association of the deposited items with the particular customer or user of the automated banking machine.

In the exemplary embodiment when the user wishes to deposit an instrument such as a check, the automated banking machine operates to verify the authenticity of the check and to read data therefrom. In response to the user first providing appropriate identifying inputs and information, the computer in the ATM operates to enable a deposited item to engage the transport section of the apparatus. The computer operates such that the deposited item is initially engaged in a limited slip manner by the variable force driving section and once sensed as substantially within the transport, operates to move the check in a generally nonslip manner.

The deposited item is moved in the transport section in the exemplary embodiment in a first direction past sensors which enable the computer to determine its length. Once the length of the deposited item is determined by moving it in the first direction, movement of the deposited item is stopped and the item is transported in an opposed direction past the analysis module. In the exemplary embodiment movement of the check past the analysis module enables the collection of data to provide an image of the check as well as the sensing of magnetic properties in areas thereof. The exemplary form of the invention does not require that the deposited check be perfectly aligned in the transport section for reading the check.

In the exemplary embodiment the computer operates responsive to inputs provided by the customer to recall from memory data representative of a template which shows the layout of information included on the particular type of item being deposited. The computer operates to adjust the image data gathered from the deposited item and to place it in correspondence with the template. Characters are then analyzed from at least one selected area of the image in accordance with the template to determine if such characters can be accurately identified. If the computer determines that these particular characters cannot be accurately identified the image data is then

5 moved relative to a template and further attempts are made to determine if data from the area of the template can be recognized. In the exemplary embodiment the data corresponding to the image of the check may be moved 180° relative to the first attempt. In this way if the check is deposited in for example, a face up orientation, either of two possible orientations for the check may be quickly analyzed. Of course alternative approaches may be used and if after a set number of attempts it is determined that the data from a particular area of the check cannot be analyzed with a sufficient degree of accuracy, further attempts may be discontinued and the deposited item returned to the customer.

10 Once data from at least one area of the deposited item is determined with a sufficient level of assurance, data from at least one other area of the item as determined by the template may be analyzed. In the case of a check the ATM is operative to determine the amount of the check as written in the courtesy amount area. The computer operates to analyze the characters and determine if the amount can be determined with a sufficient level of assurance. In the exemplary embodiment the computer operates to locate and identify the courtesy amount using
15 certain landmark rules which identify the landscape and layout of the courtesy amount area. If the computer decides that the characters in the courtesy amount area may be determined with a sufficient level of assurance, further processing of the check is enabled to be conducted. In the alternative if the amount cannot be read with a sufficient level of assurance, the deposited check may be returned to the customer.

20 In the exemplary embodiment the computer operates to analyze the characters in the micr line on the check as well as the courtesy amount. This data provides both the data sufficient to identify the institution on which the check is drawn as well as the account number of the entity

on whose account the check is drawn. The micr line also includes data representative of the check number and other information. The courtesy amount which is analyzed in the exemplary embodiment indicates the amount of the check which has been presented. This information is sufficient for a financial institution or other entity operating the automated banking machine to charge the appropriate entity for the amount of the check presented.

In the exemplary embodiment the depository apparatus is also operative to sense for the presence of magnetic coding in appropriate locations on the check. For example the computer is operative to verify that the ink in the area which has been identified as including the micr coding has magnetic properties. This provides greater assurance that the document presented is in fact a genuine check and not a photocopy of a check. The computer may operate in addition to sense magnetic or other properties from various areas appropriate for the deposited document depending on data stored in memory.

In the exemplary embodiment the computer operating in the ATM is operative to include data representative of the check information into an electronic message requesting authorization of the ATM transaction. This authorization message is transmitted to an appropriate host computer. The computer analyzes the data to verify that the user operating the ATM is authorized to conduct a deposit transaction. In addition the host computer may operate to verify that the check data corresponds to data input by the customer. The host computer may further operate to determine or communicate with other computers to verify that the account data corresponding to the check corresponds to a valid account, that the check is not subject to a stop payment order and/or that there are sufficient funds in the account upon which the presented check is drawn to provide payment therefor.

In response to the host computer determining that the check cashing transaction is suitable to be carried forward, an authorization message is returned from the host computer to the ATM. The ATM operates responsive to the authorization message to cause the check to be moved through the transport section past the printing mechanism. The printing mechanism operates to print data on the check. This data may indicate that the check has been cancelled as well as indicate the particular account of the user to which the check has been credited. In the exemplary embodiment the printing mechanism operates in the manner previously discussed to move into position in response to sensing the check adjacent thereto. This again minimizes the risk of damage to the printing mechanism or the check.

The computer also operates to control the deposit holding module such that the appropriate compartment therein accepts the deposited check. In the exemplary system the deposit holding module moves the compartment for holding the check into alignment with the outlet of the transport section. The deposited check is then held within the compartment until it is accessed by authorized personnel. Further, in the exemplary embodiment the deposit holding module is operative after receipt of the check into the appropriate compartment to move a tamping member in the compartment. The tamping member operates to assure that the deposited check as well as other checks in the compartment are properly tamped into position so as to reduce the likelihood of interference with acceptance of subsequent checks. The deposited check is then held in the appropriate compartment until removed by authorized personnel.

While the exemplary embodiment of the invention is used for accepting envelopes and checks, other embodiments of the invention may accept and process other types of instruments. These include for example utility bills, driver's licenses, gaming materials, tax documents and

other items. Such items may be analyzed by the analysis module described in the exemplary embodiment for image and magnetic properties. Alternatively such items may be analyzed for other properties which may be indicative of their genuineness and value. Further as can be appreciated, while the exemplary embodiment accepts deposited items into the machine, other embodiments of the invention may accept items from a user, analyze them and return them to the user. This includes not only items which are considered unacceptable as is discussed in the exemplary embodiment, but may also include items such as driver's licenses which are returned to the user after an image or analysis is made thereof. Numerous types of systems and activities are encompassed within the scope of the present invention.

BRIEF DESCRIPTION OF DRAWINGS

Figure 1 is an isometric view of an exemplary automated banking machine which may be used in connection with a deposit accepting apparatus and method of the present invention.

Figure 2 is a schematic view of components included within an automated banking machine of the type shown in Figure 1 and a system in which the automated banking machine is used.

Figure 3 is a schematic view of software components used in connection with the automated banking machine shown in Figure 2.

Figure 4 is a side view of a deposit accepting apparatus used in connection with an exemplary embodiment of the invention.

Figure 5 is a schematic view of the deposit accepting apparatus shown in Figure 4.

Figure 6 is a top view of the deposit accepting apparatus shown in Figure 4 with the analysis module removed therefrom.

Figure 7 is a side schematic view showing the transport portion of the deposit accepting apparatus in a position in which it accepts checks and other sheets.

Figure 8 is a view similar to Figure 7 with the deposit accepting module in position for accepting envelopes or other items.

5 Figure 9 is a side schematic view of the variable force driving section included in the transport section of the deposit accepting apparatus with the drive shown in condition for providing limited slip engagement with deposited items.

Figure 10 is a view similar to Figure 9 but with the variable force driving section providing generally nonslip engagement with deposited items.

10 Figure 11 is a side view of the deposit holding module of the transport apparatus shown in a position accepting a sheet into a sheet holding compartment.

Figure 12 is a view similar to Figure 11 but with the deposit holding module in a condition for accepting an envelope deposit into an envelope holding compartment.

Figure 13 is an opposite side view of the deposit holding module from that shown in
15 Figure 11 with a tamping member in a position for accepting entry of a sheet into the sheet holding compartment.

Figure 14 is a view similar to Figure 13 but with the tamping member disposed downward to tamp sheets held in the compartment.

Figure 15 is a view similar to Figure 14 but with an access door to the sheet holding
20 compartment in an open position.

Figure 16 is a view similar to Figure 14 but with the tamping member disposed upward from the sheet holding compartment to enable a user to access sheets therein.

Figure 17 is a side view of a printing mechanism used in connection with the deposit accepting apparatus shown in Figure 4 with the printer shown in a non-printing position.

Figure 18 is a view similar to Figure 17 but with the printing mechanism shown in a printing condition.

5 Figure 19 is a schematic view of hardware and software components used in connection with the deposit accepting apparatus and the automated banking machine of the exemplary embodiment.

Figure 20 is a schematic view of the interaction of components used in connection with accepting documents in the deposit accepting mechanism.

10 Figures 21-25 are schematic views representing a series of steps executed through use of the deposit accepting apparatus in connection with accepting a check in the machine.

Figure 26 is a top schematic view of the exemplary deposit accepting apparatus showing a document accepted therein in a skewed position.

15 Figure 27 is a schematic view of a check adjacent an analysis module in the deposit accepting apparatus of the exemplary embodiment and the devices used for sensing magnetic properties thereof.

Figure 28 is a schematic view of an exemplary magnetic profile generated by the document shown in Figure 27.

20 Figure 29 is an exemplary logic flow executed by an automated banking machine in accepting an envelope deposit through the deposit accepting apparatus.

Figures 30-33 describe an exemplary embodiment of the logic flow executed by an automated banking machine in accepting a check through the deposit accepting apparatus.

Figure 34 is a schematic view showing how data representative of an image of a deposited instrument is modified and aligned in an exemplary embodiment for purposes of analysis.

Figure 35 is a schematic view of the application of a template for a particular type of deposited instrument to image data for an instrument deposited to the deposit accepting apparatus of an exemplary embodiment.

Figure 36 is a top plan view of an alternative form of the variable force driving section included in the transport section of the deposit accepting apparatus which includes a document alignment device.

Figure 37 is a side schematic view corresponding to figure 36 showing the mechanism actuating the variable force driving section and document alignment device.

BEST MODES FOR CARRYING OUT INVENTION

Referring now to the drawings and particularly to Figure 1, there is shown therein an exemplary embodiment of an automated banking machine 10 of the present invention which includes an exemplary deposit accepting apparatus and which performs an exemplary method of operation. Automated banking machine 10 is an ATM. However it should be understood that the present invention may be used in connection with various types of automated banking machines and devices of other types. Automated banking machine 10 includes a user interface generally indicated 12. User interface 12 includes input and output devices. In the exemplary embodiment the input devices include a plurality of function buttons 14 through which a user may provide inputs to the machine. The exemplary input devices further include a keypad 16 through which a user may provide numeric or other inputs. A further input device in this

exemplary embodiment includes a card reader schematically indicated 18. Card reader 18 may be of the type used for reading magnetic stripe cards, smart cards or other articles presented by a user. Another input device on the exemplary machine includes an image capture device 20. The image capture device may be a camera or other device for capturing the image of a user or the surroundings of the machine. The exemplary embodiment may include biometric reading devices. Such devices may include an imaging or reading device such as a fingerprint reader, iris scan device, retina scan device or other biometric input. It should be understood that the camera mentioned may serve as a biometric reading device in some embodiments.

The user interface 12 also includes output devices. In the exemplary embodiment the output devices include a display 22. Display 22 includes a visual output device such as a CRT or LCD for providing messages and prompts to a user. These messages and prompts may be responded to by inputs from the user through the function buttons 14 adjacent to the display or by inputs through the keypad 16 or through other inputs. A further output device in the exemplary embodiment includes an audio output device schematically indicated 24. The audio output device may be used to provide audible outputs to the user. A further output device in the exemplary embodiment includes a printer. The printer may be used to provide outputs in the form of receipts or other items or information to the user. The printer is in connection with a printer outlet in the user interface indicated 26 in Figure 1.

It should be understood that the input and output devices shown are exemplary and in other embodiments of the invention other types of input and output devices may be used. Such input and output devices commonly receive information which is usable to identify the customer or their account. Such devices are also operative to provide information to a user and to receive

instructions from a user concerning transactions which are to be carried out through use of the machine. Various forms of user interfaces and input and output devices may be used in connection with embodiments of the invention.

In the exemplary embodiment ATM 10 includes a cash dispensing mechanism. The cash dispensing mechanism is selectively operated to enable the dispensing of cash to authorized users of the machine. Cash is provided to the users through a cash outlet indicated 28. A further feature of the exemplary embodiment of the invention is the ability to accept deposits through the ATM. The machine includes a deposit accepting opening 30. In the exemplary embodiment the ATM is enabled to accept deposits in the form of sheets, envelopes and other items as later discussed.

Figure 2 shows a schematic view of the computer architecture associated with ATM 10 and an exemplary system in which it is used. The ATM includes one or more computers therein. The one or more computers in the exemplary embodiment is schematically represented by a terminal processor 32. The terminal processor is in operative connection with one or more data stores schematically represented 34. The terminal processor operates to control transaction function devices 36 which are included in the ATM. These transaction function devices include devices which operate in the ATM to carry out transactions. Transaction function devices may include, for example, currency dispensing mechanisms, currency presenters, currency acceptors, currency validators, item dispensing devices, card readers, printers, depositories, other input and output devices and other devices. Transaction function devices may further include cameras, sensors, image capture devices and other items. The particular character of the transaction

function devices depends on the particular capabilities for carrying out transactions to be provided by the ATM.

In the exemplary embodiment ATM 10 exchanges messages through a communication interface 38 with a communications network 40. Network 40 may be one or more types of data communications network, including a phone line, data line, lease line, wireless network, telecommunications network or other medium for communicating messages to and from the ATM 10. The communications interface provided is suitable to work in connection with the particular type of network(s) to which the machine is connected. In the exemplary embodiment the ATM is connected to a network which communicates with a plurality of ATMs such as Cirrus®, Plus®, MAC® or other debit card network. Of course in other embodiments other suitable networks for processing credit, debit or other types of online transactions may be used including the Internet.

As schematically represented in Figure 2, network 40 is in operative connection with one or more host computers 42. Host computers 42 in the exemplary embodiment are operative to authorize transaction requests which are made by users at the ATM 10. The ATM is operative to deliver to the host computer data identifying the user and/or their account and the particular transactions that they wish to conduct. The request is routed through the network to a host computer that can evaluate and/or authorize the request. The appropriate host computer receives and analyzes this data and returns to the ATM a message which indicates whether the transaction requested is authorized to be conducted at the machine. In response to receiving a message indicating that the transaction should proceed, the ATM operates the transaction function devices to carry out the requested transaction. If the transaction is not authorized the user is so informed

through the display and the transaction is prevented. The ATM is also operative in the exemplary embodiment to send to the host computer authorizing the transaction, a completion message which includes data indicative of whether the transaction was able to be carried out successfully. Upon receiving the information that the transaction was carried out, the host
5 computer is operative to take appropriate action such as to credit or debit a user's account. It should be understood that this system shown in Figure 2 is exemplary and in other embodiments other approaches to operating automated banking machines and authorizing transactions may be used.

In the exemplary embodiment of the invention the transaction function devices include a
10 deposit accepting apparatus. The deposit accepting apparatus is capable of accepting deposited items such as envelopes as well as sheets and documents such as checks. This deposit accepting apparatus in alternative embodiments may be capable of accepting and analyzing other items such as papers, instruments, billing statements, invoices, vouchers, wagering slips, receipts, scrip, payment documents, driver's licenses, cards and items which may be moved in the deposit
15 accepting device. Exemplary deposit accepting apparatus may alternatively be referred to herein as an "intelligent depository module", "depository module" or "IDM". The exemplary embodiment of the IDM of the present invention is referred to herein as 44 and the exemplary mechanical components thereof shown in Figures 4-18.

As shown in Figure 4 IDM 44 includes a transport section 46. Transport section 46
20 extends in generally a straight path from an inlet 48 to an outlet 50. Inlet 48 is positioned adjacent to a deposit accepting opening 30 through the body of the ATM 10. Access to the transport section 46 from the outside of the ATM may be controlled by a gate 52 or other suitable

blocking mechanism which operates under the control of the terminal processor 32. The terminal processor operates to open the gate only when an authorized user of the ATM is to provide items to or to receive items from the transport section of the IDM.

The transport section 46 of the IDM includes a plurality of belts or other moving members 54. Moving members 54 operate to engage items deposited into the transport section and to move deposited items in engagement therewith. The moving members are moved in response to one or more drives schematically indicated 56. In the exemplary embodiment an inlet transport section 58 moves deposited items between upper and lower belt flights (see Figure 5). Similarly, deposited items are also moved through an outlet transport section 60 in sandwiched relation between upper and lower belt flights. Between the inlet and outlet transport sections deposited items are moved past an analysis module 62. In the exemplary embodiment deposited items are moved adjacent to the analysis module in engagement with moving members that act on the lower side of the deposited item. In this way the deposited item moves in close proximity to the analysis module and in sandwiched relation between a lower face 64 of the analysis module and the upper face of the moving members. Of course it should be understood that this configuration is exemplary. For example, in other embodiments additional analysis modules may be provided so that both sides of an item are analyzed. Analysis modules or discrete devices for activating indicia to facilitate sensing, as well as for sensing indicia on items, may be provided as necessary to read indicia from items handled by the banking machine.

As represented in Figures 7 and 8, in the exemplary embodiment the deposit accepting apparatus is enabled to accept both relatively thin articles such as sheets as well as relatively thick items such as deposit envelopes. As shown in Figure 7 thin articles such as checks or other

5 sheets are moved through the transport section with the upper and lower moving members in close proximity. In the exemplary embodiment, the upper portion of the transport section is movable relative to the lower section and is biased adjacent thereto by gravity or other suitable biasing mechanism. In this way a relatively thin deposited item is biased to engage the moving members in the transport section. Relatively thin articles such as checks and other sheets are moved between the inlet 48 and the outlet 50 in the transport section with the transport in the configuration generally shown in Figure 7. In this configuration the moving members and analysis module in the upper portion of the transport section are biased to maintain engagement with the sheet so as to enable selectively moving the sheet through the transport section.

10 It should be noted that in the exemplary embodiment of the invention a single drive is used for moving the moving members in both the upper and lower transport sections. This is accomplished in the exemplary embodiment through use of a connecting gear train 66 which serves as a transmission device which transmits movement between the lower belt flights and the upper belt flights. A connecting drive belt 68 is used to transmit movement between the upper portions of the inlet and outlet transport sections 58, 60 respectively. The connecting drive belt extends adjacent to the analysis module 62. Of course this approach is exemplary and in other embodiments other arrangements of drives and transmission devices may be used.

20 As represented in Figure 8 when a relatively larger item is deposited into the transport section, the upper and lower transport sections are enabled to separate to a degree sufficient to accommodate the thickness of the particular item. The configuration of the gear train 66 enables providing moving force to the moving members in both upper and lower sections of the transport within a relatively wide range of thicknesses. The exemplary structure further enables each end

of the transport section to move both vertically and rotationally relative to one another while still continuing to reliably transport items therein. An inserted deposited item overcomes the biasing force applied to the deposited item by the transport sections to enable the item to move between the upper and lower moving members that bound the path 53 between the inlet 48 and outlet 50.

5 The biasing force further enables providing positive engagement with the deposited item to reliably move the item along the path. It should be understood however that this particular configuration for the transport is exemplary and in other embodiments of the invention other approaches may be used.

10 In the exemplary embodiment of the invention the inlet transport section 58 may be operated responsive to the terminal processor as a variable force driving section. This is achieved through use of the mechanism schematically represented in Figure 9. As shown in Figure 9 the inlet transport section includes moving members comprising one or more upper belt flights 70 and one or more lower belt flights 72 in generally opposed facing relation. The number of upper and lower belt flights will depend on the particular configuration of the transport used. In certain embodiments of the invention the upper and lower belt flights may be 15 in generally aligned facing relation or may be transversely disposed from one another.

The upper belt flight 70 which serves as a moving member is supported on an upper roller 74. The lower belt flight 72 is supported on a lower roller 76 which is generally disposed in opposed relation below roller 74 and which serves as an opposed moving member. Upper roller 20 74 is journaled on a supporting member 78. Supporting member 78 is supported through and is rotatable about a pivot axis 79 which extends axially through support shaft segments 80. An actuator 82 such as a solenoid selectively moves the supporting member between the position

shown in Figure 9 and the position shown in Figure 10. This is done in response to operation of the terminal processor 32 and enables the inlet transport section to be selectively changed between a low drive position in which limited slip is provided between the belt flights 70 and 72 and a deposited item, and a high drive position in which generally no slip occurs between the belt flights and the deposited item.

Figure 9 shows the inlet transport section in the low drive position. In the exemplary embodiment roller 74 is supported through roller shaft segments 84. Shaft segments 84 are journaled in and movable in elongated u-shaped slots 86 in connection with supporting member 78. Each slot 86 is bounded by a u-shaped bounding surface 87. The slots are generally radially aligned relative to pivot 79. A biasing spring schematically indicated 85 or other appropriate biasing mechanism is provided for urging roller shaft segments 84 toward a downward position in the slot.

In the position shown in Figure 9 an item such as a check which is engaged between the belt flights 70 and 72 is enabled to slip therein responsive to the limited biasing force which acts to push roller 74 downwards. This results because roller shaft segments 84 move relatively readily on the vertically extending portions of the bounding surface as the upward directed reaction force caused by the inserted item is resisted only by downward biasing force. This enables for example, a user who is placing a check into the transport section to hold the check for a period of time while it engages between the belt flights. The limited slip minimizes the risk that the check will be torn if the user does not release it promptly. Such limited slip engagement further enables a check or other inserted item to move angularly relative to movement along the direction of transport. This may occur for example by the engagement of an outward end of the

item with a user's hand as the item is pulled into the machine and/or by one or more surfaces bounding the opening in the machine through which the item passes.

Upon sensing with one or more appropriate sensors schematically indicated 89 that the check is moved sufficiently into the transport path, the terminal processor is operative to move the actuator 82 to place the inlet transport in the high drive position shown in Figure 10. A connecting member 88 moves the supporting member 78 about support shaft segments 80. This change in orientation of the slots increases the downward biasing force applied by the roller 74 onto the deposited item. This results in the exemplary embodiment because the upwardly directed separating force is now resisted by engagement of roller shaft segments 84 with bounding surface 87. In addition the rotating shaft segments 84 engage bounding surface 87 so that the roller shaft segments are further urged downward in the slot 86 towards an end portion 81 as shown in Figure 10. This causes the item to be more positively engaged between the belt flights and generally prevents slippage. This feature is useful as later discussed in helping to measure the length of a deposited item for imaging purposes.

Figures 36 and 37 show an alternative form of an inlet transport section generally indicated 59. Inlet transport section 59 is generally similar to inlet transport section 58 except as described. Inlet transport section 59 includes an upper roller 75 and a lower roller 77. In the exemplary embodiment the rollers have moveable members in the form of belt flights supported thereon. Of course it should be understood that in other embodiments, other types of wheels, rollers or other moving members may be used.

Upper roller 75 is enabled to provide a variable slip driving force through movement of a supporting member 83. Supporting member 83 is similar in the exemplary embodiment to

supporting member 78 and is movable responsive to an actuator 91. The actuator 91 is operative to selectively change the orientation of the supporting member 83 to selectively change the degree of engagement between the belts moving on roller 75 and an item moving through the transport. A guide device 93 is positioned in the inlet transport section 59. In the exemplary embodiment guide device 93 includes a pair of moveable side rails 95. Side rails 95 are biased in a downward direction as shown in Figure 37 by a spring mechanism 97. As indicated in Figures 36 and 37, the guide rails are tapered both vertically and transversely adjacent the end portions thereof. This facilitates movement of documents adjacent to and underneath the side rails and reduces the risk of items being caught on the side rails.

As schematically represented in Figure 37 in the exemplary embodiment the side rails 95 are operatively connected with the actuator 91 through a connecting mechanism 99. The connecting mechanism operates such that when the drive is operated such that there is more slip between the moving member and an inserted item, the side rails 95 are biased in a downward direction. In this condition the rails are biased toward the transport path in which the document moves with a relatively greater force than when the drive is in greater positive engagement with the document. In this way the guide device 93 acts to position skewed or otherwise misaligned documents more readily relative to the transport path when the drive is in limited slip engagement. This may help to position the document rotationally or in alignment with the transport path through engagement of the deposited item with at least one of the side rails. It should further be understood that the spring biased character of the alignment device, enables the device to engage an upper surface of a document without causing damage thereto or preventing movement of the document along the transport path in response to the urging of the

moving members. It should be further noted that the configuration of the exemplary embodiment of the guide device facilitates aligning of documents in the transport path when documents are moving either in the inward or the outward direction.

As can be seen from Figure 37, when the connecting mechanism moves to place the drive in a more positive engagement with the document, the downward biasing force of the side rails is reduced. This is done because once the drive is more positively engaged with the deposited item, the item is not as readily reoriented relative to the transport path. It should be noted that although in Figure 37, this is represented as being done using a cam and follower arrangement, in other embodiments the biasing force on the guide device may be changed through other mechanisms. In addition it should be understood that the mechanism shown is exemplary and in other embodiments the guide device may be moved away from the deposited item rather than merely having the biasing force acting on the item reduced.

In the operation of this exemplary embodiment of the invention, the depository module in which the variable force inlet transport is used accepts both single sheet like items as well as larger items such as depository envelopes. In other embodiments larger items consisting of multiple sheets such as passbooks may also be transported. In this exemplary embodiment larger items are generally transported through the inlet transport section 59 without a need to engage the items more firmly than is accomplished in the limited slip engagement condition of the transport. In such cases, the controller operating within the banking machine, operates in accordance with its programming and responsive to the at least one input by the user concerning the type of item being transported, to operate the inlet transport in the limited slip configuration. The computer does not cause the transport to change to the more positive engagement condition as

such item passes through. In these circumstances the drive members as well as the guide device may be biased away by the force of the item passing through the transport so as to enable the particular item to pass. Of course in some embodiments if the item is sensed as hung up in the inlet transport, the controller operating the ATM may attempt to more positively engage the item so as to move it through the transport. For single sheet items, such as checks or other documents, the inlet transport section 59 may operate in response to one or more user inputs concerning the type of item being deposited, to initially provide more limited slip between the deposited sheet and the moving members. During this more limited slip condition the biasing force on the guide device acts to position the guide device more firmly in the transport path. This helps to align the document with the transport path during the period of limited slip engagement. Thereafter after the deposited item has moved further into the transport path, the supporting member 83 may be moved to provide a more positive engagement. As this is done the force applied by the guide device 93 is reduced as the more positive engagement between the moving members and the deposited item will tend to move the item in its then current orientation. Of course it should be understood that the guide device and the mechanism shown are exemplary and in other embodiments other types of devices and mechanisms may be used equivalently to accomplish the described functions.

The exemplary embodiment of the invention further includes a deposit holding module schematically indicated 90 (see Figure 4). In the exemplary embodiment the deposit holding module includes a plurality of compartments which are moved relative to the outlet 50 of the transport section to enable items to be passed from the transport section into a selected compartment. The deposit holding module includes a drive 92 which is part of a translation

mechanism 94 of the screw type. The translation mechanism operates to move the compartments in a generally vertical direction relative to the outlet 50 in the transport section. The deposit holding module further includes a tamping member 96 which is movable in the compartment and operates to tamp sheets held in a sheet holding compartment so as to reduce the volume of sheets held therein until the items may be removed.

The operation of the deposit holding module 90 in connection with the exemplary embodiment is represented in Figures 11 through 16. As shown in Figure 11 a sheet holding compartment 98 in the deposit accepting module 90 is adapted for holding sheets 100 of one type such as cancelled checks or other items accepted in the machine. The sheet holding compartment 98 includes an opening 102 in an upper area thereof generally indicated 103. Opening 102 may be selectively moved responsive to signals from the terminal processor and operation of drive 92, to be in communication with outlet 50. The tamping member 96 may also be selectively moved upward such that a sheet leaving the transport section through the outlet such as sheet 104, may be passed into the sheet holding compartment 98.

When deposit envelopes are to be accepted, the controller responsive to at least one input through the user interface indicating an envelope deposit, may operate the drive 92 to move the position of the compartments within the deposit holding module so that an envelope holding compartment 106 is placed in communication with the outlet 50 of the transport section. This is accomplished as represented in Figure 12 by bringing an opening 108 to compartment 106 into alignment with the outlet 50. This enables an envelope deposit such as an envelope schematically represented 110 in Figure 12 to be moved into the envelope holding compartment 106.

It should be noted that the movement of the compartments relative to the outlet enable selectively aligning the openings to the various compartments with the outlet from the transport. This minimizes the amount of handling and manipulation of the deposits that is necessary to move them through the deposit accepting mechanism. This increases reliability and speed of the exemplary embodiment of the invention. Further in the exemplary embodiment the controller is enabled to selectively move the position of the tamping member 96 relative to the sheets in the sheet holding compartment 98. The tamping member is enabled to move about a non-fixed pivot 112 between positions such as those shown in Figures 11 and 12. The ability to downward dispose the tamping member relative to the sheet stack enables compressing the stack of sheets 100 that may be present in the sheet holding compartment so as to reduce their volume. This enables accepting sheets more reliably and holding more sheets in the sheet holding compartment before the accumulated sheets need to be removed. It should be noted that the movement of the tamping member 96 is achieved through an operative interconnection with the translation mechanism which moves the compartments as shown in Figure 4. Further the tamping member is connected to the body of the deposit holding device through the nonfixed pivot connection so that the action of the tamping member is enabled to accommodate various sized stacks of sheets within the sheet holding compartment.

Figure 13 shows an opposite hand view of the sheet holding compartment 98 and the tamping member 96. As shown in Figure 13 the tamping member may be moved upward to a position that enables sheets to enter the sheet holding compartment when the outlet of the transport section is moved adjacent to the opening to the sheet holding compartment. In the exemplary embodiment the tamping member is moved responsive to a moving mechanism

indicated 101. The exemplary moving mechanism includes a member which engages an aperture in a wall member. The wall member in the embodiment shown remains relatively stationary.

Vertical movement of the module 90 is operative to selectively move the tamping member. In the position shown in Figure 13 in which an item may be accepted into compartment 98, the tamping member is positioned so that the opening 102 is disposed between the tamping member and a closed end of the compartment generally indicated 105.

Figure 14 shows a similar view of the sheet holding compartment with the tamping member moved downward toward closed end 105 so as to facilitate the tamping of sheets which may be stored therein. An exemplary embodiment of the invention further includes the capability for authorized personnel to remove accumulated sheets from the sheet holding compartment. As will be appreciated the deposit holding module is positioned within the interior of the ATM 10. Preferably the interior of the ATM 10 includes a secure storage area or chest to which access is limited by a suitable locking mechanism. U.S. Patent No. 5,970,890 which is incorporated herein by reference, shows such a chest and locking mechanism. Only authorized personnel are enabled to access this area through use of an appropriate combination, key or other secure technique.

Authorized personnel who have gained access to the interior of the ATM chest are enabled to remove accumulated sheets from the sheet storage area through an access opening. This is done in the exemplary embodiment by opening an access door 112 as represented in Figure 15. In the exemplary embodiment the access door is on an opposed side of the compartment from the inlet opening through which items enter the compartment, but in other embodiments other arrangements may be used. Door 112 in embodiments of the invention may

have in connection therewith an additional locking mechanism. Such locking mechanisms may include key, combination, electronic, biometric or other opening types. Alternatively it may be sufficient to enable door 112 to be opened by a user who has gained access to the interior of the machine. Alternatively embodiments of the invention may enable a user to operatively disengage the tamping member 96 from the mechanism which normally controls its movement and to allow the tamping member to be moved upwardly away from the sheet storage compartment 98. This is represented in Figure 16. Such upward movement may enable an authorized user to gain access to the sheet holding compartment for purposes of removing sheets. In the embodiment shown both the capability of opening a door 112 and moving the tamping member to access accumulated sheets may be provided.

Likewise suitable mechanisms for accessing accumulated envelope deposits may be provided. This may include for example access openings and/or access doors for accessing accumulated envelopes in the envelope holding compartment 106. Alternatively the envelope holding compartment may be provided as a removable enclosure which may be removed entirely in a locked condition from the machine and replaced with a suitable empty deposit holding container. Various approaches to removing deposited items from various storage compartments may be used in embodiments of the invention.

Referring again to Figure 4 the exemplary embodiment of the IDM 44 includes a printing mechanism 114. Printing mechanism 114 which is shown in greater detail in Figures 17 and 18 is operative to enable printing on deposited items responsive to control of the terminal processor. Such printing may be used in the exemplary embodiments to print identifying indicia on deposited envelopes or documents. Alternatively such printing may be used to indicate the

cancellation or acceptance of items placed into the machine by a user and which are stored in the machine or returned to the user from the machine. It should be understood that although in the exemplary embodiment the printer is shown on a first side of the transport path, in other embodiments the printer may be positioned on an opposed side of the transport path.

5 Alternatively printing devices of similar or different types may be positioned on both sides of the transport path in some embodiments.

In the exemplary embodiment the printer 114 is operative to minimize the risk that the printer will snag or damage deposited items that are moved adjacent to the printer in the transport section 46. Printer 114 includes a suitable print head 116. Print head 116 is directed towards
10 items which may pass the printer mechanism in the transport section. A registration platen 118 is positioned in opposed relation of the print head on the upper section of the transport. As schematically represented, a sensor 120 is positioned adjacent to the print head so that the presence of deposited items adjacent thereto may be sensed.

In the exemplary form of the printer mechanism the print head 116 is mounted in
15 supporting connection with a support plate 122. The support plate is movably mounted relative to a frame of the IDM 44. An actuator 124 is selectively operative responsive to signals from the terminal processor to move the support plate 122 and the print head 116 selectively adjacent to or away from deposited items which move through the transport section. The actuator 124 accomplishes such movement of the print head by moving a bracket 126 in a generally horizontal
20 direction. Bracket 126 includes angled guide slots 128 therein. Pins 130 extend in the angled slots and are operatively connected to support plate 122. The movement of bracket 126 between

the positions shown in Figures 17 and 18 are operative to cause the print head to move between nonprinting and printing positions.

In the exemplary form of the invention one or more sensors represented schematically as a sensor 120 are used to indicate to the terminal processor that the deposited item is moved adjacent to the printer. The terminal processor operates to then move the printer into the printing position at a time when the leading edge of the deposited item has already moved to a position beyond the print head 116. This reduces the risk that the deposited item will snag on the print head and will be torn or otherwise damaged by engagement therewith. It should be understood that printing may be conducted with the items moving through the transport section 46 in either direction adjacent to the print head. In this way indicia may be printed on deposited items as they move either toward or away from the deposit holding module. This enables printing on items which are either stored in the machine or which are accepted, marked or otherwise printed upon and then returned to the customer. It should further be understood that the particular configuration of the printing mechanism is exemplary and in other embodiments of the invention, other types of printing mechanisms may be used.

In the exemplary embodiment of the present invention the analysis module 62 includes optical scanning sensors schematically indicated 132 in Figure 5. Scanning sensors 132 are operative to generate an image of documents that move adjacent to the analysis module. In the exemplary embodiment the scanning sensors scan generally the entire transverse path through which documents may travel in the transport section. The scanner in the described embodiment generates radiation in the visible range and resolves images at approximately 240 dots per lineal inch. The scanning sensor is also operative to have a focal length which corresponds to the

distance that the scanned documents are disposed from the surface of the sensor as they pass the analysis module. In the exemplary embodiment the scanning sensor 132 has a focal length of about 4 millimeters. Of course in other embodiments other types of scanning sensors may be used. Such other types of sensors may include emitters and sensors for sensing radiation at discrete frequencies in the visible or non-visible range. In addition multiple sensor types may be used on one or both sides of documents.

The analysis module further includes magnetic sensing elements 134. The magnetic sensing elements 134 are operative to sense the magnetic properties of documents which pass adjacent to the analysis module. In the exemplary embodiment the magnetic sensing elements 132 include a plurality of discrete transversely spaced magnetic sensors. The magnetic sensors generally each cover a relatively small portion of the overall transport width. The sensors are arranged in sufficient proximity so that substantially the entire transverse width of the document path is sensed. The analysis module further includes a magnet 136. Magnet 136 may comprise a unitary or a plurality of permanent or temporary magnets. In the exemplary embodiment permanent magnets are used. The permanent magnets operate to activate magnetic properties of magnetic inks on documents passing adjacent to the analysis module. These magnetic properties may then be more readily sensed by the magnetic sensing elements 134.

It should be understood that the particular sensors and devices in analysis module 62 are exemplary. Other embodiments may include only an optical scanner or magnetic sensing elements, or different or additional types of scanning and sensing elements. For example embodiments of the invention may include scanners for reading bar code or other types of optical indicia. Other embodiments may include devices for reading magnetic flux reversals that may be

encoded in a magnetic media. Other embodiments of the invention may include devices which are operative to detect the presence of holograms or to read non-visible radiation, fluorescent inks, or other types of coding. The particular activating and sensing devices included in a particular analysis module will depend on the particular types of documents to be verified and analyzed through operation of the invention.

Figure 3 shows schematically the relationship of the IDM 44 with software components which operate in the terminal processor 32. The terminal processor 32 has operating therein an operating system layer schematically indicated 138. The operating system layer 138 may include operating systems such as OS/2® from IBM, Windows NT® from Microsoft or other suitable operating system. The operating system communicates with a terminal control software layer 140. The terminal control layer in the exemplary embodiment operates to control numerous aspects of the ATM functions including aspects of the transaction function devices. As schematically represented in Figure 3 the terminal control software sends messages to and receives messages from devices associated with the IDM 44. The messages are generally operative to control mechanical components of the IDM as well as to receive inputs from sensors and other devices which operate in connection with the deposit accepting function.

The exemplary software architecture of the invention also includes a recognition subsystem software layer 142. The recognition subsystem layer also communicates with the operating system layer and the terminal control software layer to control and receive inputs from the IDM. The recognition subsystem layer includes software which functions to control, manipulate and analyze image data received from the IDM as schematically represented by image control component 144. Another software component of the recognition subsystem layer

accomplishes character recognition. This character recognition component schematically represented 146 in the exemplary embodiment is operative to identify micr coding and numerical characters. In the exemplary embodiment the character recognition software includes software that is commercially available from Check Solutions, Inc. Of course other suitable recognition software may be used. The recognition subsystem 142 of the exemplary embodiment also includes a magnetic data control component schematically represented 145 that is operative to analyze and to manipulate data received from the magnetic sensing elements and to check for correlation between the magnetic data that is sensed and the optical data which is obtained from the scanning activity. Of course these software functions are exemplary and these functions may be programmed differently and other or additional software components may be included in other embodiments.

Figure 19 shows the exemplary schematic components of the software in greater detail. As can be appreciated the operating system 138 in the terminal processor is in operative connection with one or more data stores 34. The data store may include the information concerning programs, transactions and other data or program logic which are necessary to control the operation of the ATM. In addition the data store includes the data used in connection with analyzing and verifying documents. As later discussed the data store may also include data corresponding to the images of documents that have been accepted by the system. The software in connection with the exemplary terminal processor also includes a communication subsystem layer 148. The communication subsystem layer enables communication between the various software components of the system. The communication subsystem layer also communicates with the various transaction function devices 36 through appropriate interfaces or drivers. In

addition communication layer 148 in the exemplary embodiment also enables communication through appropriate interfaces 38 to one or more communications networks 40 and the host computers 42 which are operatively connected thereto.

5 In the exemplary embodiment the IDM 44 includes an onboard computer which resides on a scanner card 150. The scanner card 150 further receives and operates upon data from the optical scanning sensors 132 on the analysis module 62. The scanner card further has included thereon a driver schematically indicated 152. The driver is operative to communicate through a scanner interface 154 with the operating system 138 and the data store 134. The driver 152 is also operative to control the scanning activity which is carried out by the scanner card 150. In
10 the exemplary embodiment the driver is also operative to control the allocation of memory for use in the scanner operation. This assures that adequate memory is available in RAM to carry out the capture, storage and analysis of the scanning data as required to analyze and authenticate documents which may be input in the machine.

As represented in Figure 20 in the exemplary embodiment, when a document is to be
15 scanned the terminal control software 140 causes the particular document to be moved as desired in the IDM 44. This is done by controlling the various devices which sense and move documents in and through the module. The terminal control software 140 operates in conjunction with the recognition subsystem 142 which provide instructions to the scanner card 150 to scan documents using the optical scanning sensors 132 during the appropriate time periods. The data from the
20 scanning process and magnetic sensing operations is returned through the operating system to memory. The data is then recovered from memory and manipulated responsive to the image control and character recognition features of the recognition subsystem 142. The results of the

manipulation and analysis of the scanned data is then communicated through the terminal control layer to a remote host 42. This is done in the exemplary embodiment using transaction request and authorization messages of a type that can be handled within the framework of ATM transaction processing systems. However it should be understood that in other embodiments of the invention other approaches to authenticating documents, verifying transactions and communicating with remote computers may be used.

The operation of the exemplary embodiment of the invention will now be explained with reference to some exemplary deposit transactions. A first deposit transaction to be described will be the deposit of an envelope type deposit into the ATM 10. This is accomplished through the execution of the logic flow which is represented in Figure 29.

In this exemplary transaction the ATM first acts to receive identifying data from the customer. This may include for example the input of an article such as a credit card which is read by a card reader in the machine. Such cards commonly include information such as a user's name and/or primary account number ("PAN"). This primary account number includes data which can be used to identify the user's institution and account number. Further when the user is operating the ATM with a debit card the user is required to input further identifying data to verify that the user is authorized to access the account. Usually this verifying input includes a personal identification number ("PIN"). The PIN may be input through an input device such as a keypad. In alternative embodiments other types of identifying data may be input. This data may include for example biometric data such as iris scans, retina scans, thumbprints, facial features, voice prints or other features of a user or an article carried by the user that provides identifying data.

At the second step in the logic flow of the exemplary embodiment, the machine operates to receive from the user at least one input which corresponds to the transaction type that the user desires to conduct. Often this is done in response to the terminal processor presenting the user with an output on the display which corresponds to various transaction options. The user is then enabled to select a transaction by providing an input through one or more buttons or other input devices. In this example the user will indicate that the transaction type to be conducted is an envelope type deposit.

In a third step the ATM is operated to receive from the user an input amount that is associated with the deposit transaction. Generally this will be provided as an input in numeric form to a keypad or other input device on the machine. This numeric input which may be provided in response to a prompt on a display screen or other output device, will generally correspond to the value of the funds or other items included in the envelope deposit.

The terminal processor operating the ATM acts in a fourth step to cause an authorization request to be sent to the remote host computer. This authorization request in the exemplary embodiment includes data representative of the identifying data, the transaction type and the amount involved. This authorization request is sent through one or more networks to the appropriate host computer which may authorize the transaction. The host computer then operates in response to the authorization request to determine if the identifying data validly corresponds to an authorized user and/or account. The host computer also determines if the customer is authorized to conduct the requested transaction. The host computer then operates to formulate a transaction response which is sent from the network back to the ATM.

The ATM receives the response from the host computer at a fifth step. If the transaction is not authorized the data included in the response message operates to cause the ATM to advise the customer that the transaction cannot be performed, and then the terminal processor performs steps to close the transaction. In this example it will be presumed that the response message returned includes data indicating that the transaction is authorized and may proceed. In response to receiving the response message indicating that the transaction may go forward, the terminal processor operates in accordance with its programming to execute the steps necessary to cause the ATM to accept the envelope deposit. In a sixth transaction step the terminal processor is operative to cause the gate 52 to open at the inlet 48 to the transport section 46. This enables the user to access the transport section.

In a seventh step the terminal processor is operative to cause the deposit holding module 70 to move so that the envelope holding compartment 106 is in alignment with the outlet 50 of the transport section 46. The terminal processor is then operative to run the transport of the IDM 44 such that the envelope may be accepted therein. As previously explained sensors may be provided adjacent to the inlet to the transport such that the inlet transport section 58 provides limited slip engagement initially with the deposited envelope. Upon sensing that the envelope is entered further so that the envelope is substantially within the transport, the terminal processor may be operative to cause the envelope to be engaged more firmly with the moving members of the transport. Alternatively the envelope may be fully transported in limited slip mode.

The envelope is then moved between the moving members of a transport past the analysis module 62. In response to the at least one customer input which indicates that an envelope type item is being deposited the terminal processor of the exemplary embodiment does not operate the

analysis module to read indicia on the envelope. The terminal processor operates in accordance with its programming to formulate the indicia comprising characters or other identifying data that will be printed on the deposited envelope. This identifying data may be human language characters or other data or character sets which are sufficient to identify the deposit as associated with a particular transaction or the user at the time of verifying the contents of the envelope. This data may be derived from customer inputs, the ATM, the host computer, or combinations thereof.

In a ninth step the envelope is sensed as in a position where it is adjacent to the printer mechanism 114. In the exemplary embodiment the terminal processor operates in response to signals from sensor 120 that indicate that the leading edge of the envelope has passed the print head and will not be caught thereon if the print head moves to the print position. Upon sensing the envelope in the ninth step the terminal processor causes the printer to move into position adjacent the envelope and to print the identifying data on the envelope. The terminal processor continues to run the moving members in the transport until the envelope is sensed by appropriate sensors as having passed into the envelope compartment.

The terminal processor then operates in accordance with its programming to cause a transaction receipt to be printed and presented to the customer. The terminal processor in this exemplary transaction then operates in a next step to provide an output screen to prompt the user to indicate whether they wish to conduct a further transaction. For purposes of this example it will be presumed that the user declines such a further transaction.

In a fourteenth step the terminal processor operates in response to the user input declining further transactions to close the transaction. This may include for example returning the

customer's card, presenting a "thank you" screen, storing a record of the transaction in memory and doing other things necessary to complete this transaction and to ready the machine to conduct another transaction. The terminal processor also operates in a fifteenth step to formulate and send a completion message to the host computer. The completion message preferably indicates whether the requested transaction was carried out successfully by the machine. The host computer in response will operate to include a record in an associated data store that the customer has made a deposit in a particular amount. Generally however such a deposit will not be credited to a user's account until the content of the envelope is verified. Of course this depends on the particular institution and their policies and practices.

The operation of the ATM 10 will now be described with reference to an exemplary transaction involving the deposit of a check or similar instrument. In this transaction the logic flow described in connection with Figures 30 through 33 is carried out.

In a first step shown in Figure 30 the ATM operates to receive identifying data from the user in the manner previously discussed. In a second step the user identifies the particular transaction type to be associated with the transaction. In this case the user may indicate that they are depositing a check or alternatively that they are cashing a check or other document. Because both types of transactions are related they will be described in connection with the exemplary logic flow as though the user had selected the option of cashing a particular check. It should be understood however that generally a user will be electing either to apply the amount of the deposited check to their account, or to cash the check.

At a third step in the transaction flow shown in Figure 30 the user provides inputs corresponding to the amount associated with the transaction they wish to conduct. As optionally

indicated in the fourth step, the institution operating the ATM machine may charge a check cashing fee or similar fee for the convenience of cashing the check. If this is the case an appropriate message will be output to the user through the display of the ATM. The user may be requested to provide an input to indicate their acceptance of the transaction fee. If the user indicates that they do not wish to accept the fee or the user does not provide an input within a predetermined time period, the terminal processor may operate to close the transaction and return the machine to a ready state to conduct a transaction for another user. For purposes of this example it will be presumed that the user has indicated that they wish to proceed with the transaction.

In response to these inputs the terminal processor operates in accordance with its programming to open the gate 52 adjacent the opening to the transport section 46 of the IDM 44. The terminal processor also operates as indicated a sixth step to move the depository holding module 90 to a position in which an appropriate check holding compartment is in communication with the outlet 50 of the transport section.

The terminal processor next operates to cause the running of the moving members in the transport section to receive the document therein. As represented in Figure 26 entry sensors 156 operate to sense an item, which in this case is check 158 entering the transport section. The sensing of the entered item by sensors 156 may be operative as previously discussed to cause the inlet transport section 58 to first run in a manner providing limited slip. Thereafter when the item has cleared the entry sensors 156 or otherwise moved further or substantially into the transport, the moving members more firmly engage the deposited item. As can be appreciated during the time of limited slip, the item may move angularly relative to the direction of

movement longitudinally along the transport path as the result of the user holding the item or due to the guiding action of the walls bounding the opening or other guide device structure.

As represented in Figure 26 the exemplary embodiment includes at least one throat sensor 160 adjacent to the analysis module 62. The terminal processor is operative in a ninth step to measure the document length. This is done for example based on the transport speed and the time that the document takes to pass the throat sensor 160. Because in the exemplary embodiment it can be assumed that generally no slippage of the document occurs after it has firmly engaged the transport, the time that the document blocks the throat sensor generally provides a relatively accurate indication of document length. Of course in other embodiments equivalent mechanisms such as encoders on driving members or other devices may be used. The document length is calculated in the exemplary embodiment by the terminal control software. It should be understood however that this technique is exemplary and in other embodiments of the invention other approaches may be used.

As schematically represented in Figure 21, during the step of measuring the document, the document is moved past the analysis module 62 to a position intermediate of the analysis module and the deposit holding module. This position of document 158 is represented in Figure 22. The document at this point is in a "ready to scan" position. The terminal processor next operates in accordance with the eleventh step in Figure 30 to move the document in the direction of the arrow shown in Figure 22. The document is then moved past the optical and magnetic sensors in the analysis module 62 as represented in Figure 23. As the document moves past the analysis module the terminal control software and recognition subsystem software gather the image and profile data that is used to analyze the document. As the check 158 passes the magnet

136 the magnetic ink thereon is magnetized. This magnetized ink is then sensed by the magnetic sensors 134 which provide a profile of the area in which magnetic ink is present. This is represented in greater detail in Figures 27 and 28. For example in the exemplary embodiment as shown in Figure 27, check 158 includes a line 162 of micr coding. This line of micr coding causes signals to be produced by the magnetic sensing elements 134 as the characters pass such sensors. As represented in Figure 27 document 158 may be skewed relative to the transport section through which it passes. However regardless of whether the document is straight or skewed it will produce a magnetic profile.

A magnetic profile associated with the document is indicative that the document is genuine. This is because photocopies or other simulated checks generally would not include magnetic coding. Thus the sensing of any magnetic coding on the document by the analysis module suggests that the document that has been inserted is a genuine check.

Figure 28 indicates specifically the magnetic profile sensed as the document passes the magnetic sensors. This magnetic profile indicated 164 includes data which indicates the magnetic areas on the check. This magnetic profile is correlated in the exemplary embodiment by the recognition subsystem with the optical profile to further verify that the check is genuine. Of course this technique is exemplary and in other embodiments other approaches may be used.

As also represented in Figure 23 movement of the document past the scanning sensors 132 causes data to be produced which is indicative of the optical characteristics of the document passing in the transport section. This optical data is captured through the scanner card and included in the data store associated with the ATM. The scanning process is continued as the check 158 moves past the analysis module 162 as shown in Figure 4.

As indicated by the twelfth step in the logic flow in Figure 30 the terminal processor next operates to apply the rules which are associated with the programs stored in memory concerning the particular type of document associated with the transaction. Generally at least one input by the customer indicating that they are making a check deposit may be correlated with certain stored data or rules which indicate the particular characteristics of the document that is to be received. In some cases the inputs may correspond to a particular sized document. Alternatively the rules may correspond to particular configurations or other characteristics. In this example the rules stored in memory are also indicative of "windows" or particular areas in the document landscape in which data which should be analyzed on the document may be found.

In accordance with the exemplary embodiment which operates to analyze check 158, the terminal processor operates in accordance with the applicable rules recovered from memory as associated with a check deposit to deskew the data corresponding to the image and place it in registration with an imposed coordinate system. This is done in the exemplary embodiment through use of a programmed series of steps which finds the boundaries of the image data. This is done by comparing the pixels which make up the image and generating at least two of the lines which bound the document. By identifying these lines, one or more corners of the document may be identified. This process is represented in Figure 34 by the skewed profile of check 158 which is shown in solid lines.

In the exemplary embodiment, after finding the two leading corners of the document and 168 and the most closely adjacent trailing corner to a "x" coordinate 170, the terminal processor operates in accordance with its programming to adjust the data corresponding to the image. The terminal processor first operates to adjust the image by rotating the image data about

corner 168. This causes the image to be "squared up" relative to the imposed coordinate system as represented by a phantom image 172. The computer next operates to shift the squared up image data to a reference point of the coordinate system. This shifting places the leading corner 168 at the origin of the imposed x and y coordinate system. The leading corner 166 is placed along the "y" axis while the trailing corner 170 is placed along the x axis. It should be understood that all of the pixels which make up the image data are correspondingly adjusted through this process to produce the shifted image 174 which is shown in phantom in Figure 34.

As represented by the fourteenth step shown in Figure 31 the terminal processor next operates in accordance with its programming to apply template logic to the shifted image 174.

The computer operates to recover from memory, data corresponding to at least one selected template. In exemplary embodiments a plurality of templates may be stored in memory and the selected one is recovered responsive to customer inputs to the machine, indicia read from the document or other data. In this step the computer operates to apply a template over the shifted image to identify for analysis "windows" within the image that contain data that is of interest.

This is represented schematically in Figure 35. In Figure 35 a template is schematically indicated 176. Template 176 includes a first window 178 which generally corresponds to an area in which a micr line on a check may be located. Template 176 further includes a second window 180. Window 180 corresponds to an area of the landscape on the check where a courtesy amount which represents the value of the deposited check may be located. It should be understood that these windows are exemplary and in other embodiments other or additional windows may be included. It should further be understood that these processes for identifying windowed areas within shifted data are carried out through operation of the computer and the recognition

subsystem software and that these graphic representations shown in the Figures merely serve to explain the nature of an exemplary form of the analysis that is carried out.

As represented in a fifteenth step shown in Figure 41 the computer operates to analyze the data in the window of the template which corresponds to the potential location of the micr line. This is accomplished by the image control component 144 of the software analyzing data from the data store. It should be understood that the data within the particular window may or may not correspond to the micr line depending on the orientation of the document as well as whether the document itself is valid.

The computer then operates in accordance with a sixteenth step represented in Figure 31 to pass the data extracted from the window 178. This character recognition software component is operative to apply the logic used for optically reading micr symbols. In the exemplary embodiment this is a logic associated with reading e-13B type characters. The character recognition software component 146 is operative to analyze the data and make evaluations in looking for known characters of the particular type. In the exemplary embodiment the characters represented which are resolved are processed to derive ASCII values corresponding to the characters.

In a next step as represented in Figure 31, recognition subsystem 142 is operative to check the returned data for the presence of particular characters, in this case routing and transfer characters. Generally valid micr line data will include such characters and the detected presence thereof in the data analysis is an indicator that the micr line data has been properly found and read.

At a nineteenth step shown in Figure 31 the recognition subsystem software 142 operates to determine if the degree of assurance or confidence as indicated by the character recognition

component for the values returned, is above a threshold. The determination of the level of assurance is based on one or more values delivered by the pattern recognition algorithms in the character recognition software component used in the exemplary embodiment. In the exemplary embodiment the threshold is generally set at about a 70 percent assurance level. As indicated in Figure 31 the computer operates in response to its programming to proceed based on whether the level of assurance is at or above, or below the threshold.

As indicated in Figure 31 if the level of assurance in the determined micr values is indicated as below the threshold and/or if routing and transfer characters are not found, the recognition subsystem through operation of the image control software component, operates to further manipulate the image. In the exemplary transaction the computer operates to manipulate the data to essentially transpose and flip the image 180 degrees and to again read the data in the micr line window. It should be understood that in other embodiments the data corresponding to the image may be manipulated in other ways in order to attempt to translate the image so as to find appropriate data.

As indicated in the twenty-first step in Figure 31 the translated image data now in the window 178 is again read and passed to the character recognition software component 146. This again causes the output of ASCII values based on the characters in the window. As indicated in the twenty-fourth step these values are then checked for the presence of routing and transfer values. As indicated in step twenty-five in Figure 31, if the micr values read have an associated level of assurance at or above the threshold and routing and transfer characters are present the recognition subsystem is operative to proceed with further analysis of the image. However if the level of assurance remains below the threshold and/or there are no routing or transfer characters,

5 window which essentially can be thought of as reducing the sensed data to black and white. This further assists in identifying the characters. The character recognition component 146 then applies its logic in looking for U.S. dollar type numerical characters within the data, and as represented in a twenty-ninth step in Figure 32, the recognition subsystem outputs and ASCII values indicative of the courtesy amount. In some embodiments the level of assurance associated with the courtesy amount is also analyzed to determine if it is above a threshold to verify that the amount has been accurately read. Alternatively, or in addition, the derived courtesy amount may be compared to the data input by the customer concerning the amount of the check. If there is a discrepancy and/or the level of assurance is below the threshold the check may be returned and the transaction closed.

10 The recognition subsystem further operates in accordance with the thirtieth step represented in Figure 32 to check for the presence of magnetic ink on the document in the proper location. This is done in the exemplary embodiments by component 145 determining the length and configuration of the magnetic profile associated with the document. This length and orientation data may be normalized in the manner of the image data based on the imposed coordinate system, and compared therewith to verify that the magnetic areas correspond to the optical data corresponding characters in the micr line. In addition certain documents may also include magnetic characters in other areas of the document. These other characters which may not necessarily be included within the optically analyzed data, may be further checked to provide an indication of the genuineness of the document. Of course in alternative embodiments as previously discussed, the mere presence of magnetic ink on the document may serve as a sufficient indication that the document is genuine.

this may be an indication that the document is not valid. In embodiments of the invention the ATM may operate to further transpose the data and conduct additional analysis. This may be particularly appropriate in situations where both sides of the document are being scanned and the document may be in different orientations. In this case the terminal processor causes the ATM to operate to return the document to the customer and to close the transaction.

As represented in the logic flow which continues in Figure 32, if the characters in the micr window are read with a level of assurance that is at or above the threshold and the routing and transfer characters are present, the terminal processor next operates to cause the courtesy amount data in the window 180 to be read. In the exemplary embodiment the recognition subsystem operates in response to landmark rules associated in memory with the document type to assist the analysis in finding the courtesy amount within the window. These techniques may include for example in the reading of a check, looking for the box or line on which the courtesy amount is written. In this case the value is a monetary amount. The amount may be printed or cursive characters. It may also look for known characters such as the dollar sign, the fraction sign, decimal point or star characters which are commonly included in printed checks to indicate places before the dollar amount. Of course it should be understood that the particular templates and landmark rules used will depend on the programming of the machine and the type of document involved. The machine may have access to stored data corresponding to a plurality of templates and/or rules, and may apply them to documents based on data derived from customer inputs, the document, memory data or combinations thereof.

As represented in a twenty-eighth step in Figure 32 the terminal processor further operates responsive to the recognition subsystem to binarize the data in the courtesy amount

As indicated in the thirtieth step in Figure 32, if the magnetic data sensed does not properly correspond to the document the terminal processor operates to identify the document as suspect. The terminal processor then operates to return the document to the customer and to close the transaction. However if the document has an appropriate magnetic profile the terminal processor next moves to a step 31.

In the thirty-first step the terminal processor operates to configure and send an authorization message through the network to the host. This authorization message will generally include the data appropriately necessary in an ATM transaction message for purposes of authorizing the transaction. Such data may include customer identifying data such as PAN and PIN related data, the transaction type and the amount input. In addition the transaction data may include data derived from the document, such as data representative of the data corresponding to the characters in the micr line as well as the courtesy amount read from the check as determined by the recognition subsystem.

It should be appreciated that providing the data read from the check in numerical or other compatible format as part of an authorization message is useful for facilitating processing of the data compared to transmitting an entire image of a check to a host computer for analysis and authorization. In exemplary embodiments the check data may be included in a field in a Diebold 91x type transaction message or in a selected field in an ISO 8583 message. A host computer may readily determine the data included in such messages and analyze it for purposes of deciding whether or not to authorize the transaction.

In this exemplary transaction when the host receives the request message from the ATM, it operates to determine if the customer data corresponds to an authorized user as well as whether

the user is authorized to conduct the transaction requested. The operator of the host computer may also be enabled to apply certain rules, including preventing particular users from cashing checks or limiting the amount of the deposited check which can be cashed. Various types of rules may be selectively applied depending on the particular user and the amount of the check. In addition the host computer may also analyze the account data on the check. This may include for example communicating with other systems or data stores to determine if the account upon which the check is drawn is valid and/or holds sufficient funds as represented by the courtesy amount on the check. The computer may also compare certain data such as the courtesy amount read, to data input by the customer concerning the value of the check. The computer may also analyze aspects of the data such as the institution or the location thereof, upon which the check is drawn for purposes of applying its programmed business rules and logic and in deciding whether to allow the user to deposit or cash the check.

In accordance with its rules and logic the host in the exemplary embodiment returns a response message to the ATM. This is represented by a step 32. For purposes of this example it will be presumed that the user is authorized to deposit or cash the check. Of course if the check is not authorized to be deposited or cashed the response message includes data indicative thereof. The ATM will operate under control of the terminal processor in response to data indicative that the transaction is not authorized to return the check to the user and to close the transaction. Alternatively, if the check appears to be fraudulent the ATM may capture and store the check.

As indicated by the thirty-third step in the exemplary embodiment the ATM operates in accordance with its programming to display a graphic image of the check deposited on its display 22. The terminal processor also operates in a thirty-fourth step in the sequence to store a copy of

the image file in a data store at the ATM. This image file may be later recovered for purposes of tracking and documentation. Such image files may be compressed for purposes of saving storage space. In the exemplary embodiment the graphic image of the check is stored in memory as a PCX file. In embodiments of the invention the image file may also be accessed from or
5 downloaded to remote computers connected to the system.

The computer next operates in accordance with a thirty-fifth step to print a receipt for the customer. In the exemplary embodiment because a graphic image of the check is available within the ATM, a graphic representation of the check may be included on the receipt provided to the customer. In addition the terminal may operate to print a similar graphic image on a
10 journal printer or in other hard storage within the machine. Alternatively or in addition, in machines including a camera or other image capture device, an image of the user may be stored and/or printed in correlated relation with the check data, including on the receipt, on the check and/or on a journal.

After printing the receipt the ATM next operates under control of the terminal processor
15 to cancel and store the check. This is represented graphically in Figure 24. As indicated by the thirty-sixth step in the sequence computer causes the transport section to again move check 158 in the direction of the arrow. The check is moved towards the deposit holding module. In addition the terminal processor operates to align the appropriate document compartment so that its opening is in communication with the outlet of the transport section.

20 As indicated in a thirty-seventh step the check 158 is moved until it is sensed adjacent to the printer mechanism 114. Upon sensing the check adjacent to the printer the terminal processor operates to print cancellation data on the check. This cancellation data is printed on

the check as it moves in the transport. This may include for example information about the user and/or the transaction, including images. As indicated in a thirty-ninth step in the sequence, the transport continues to move the check until it is sensed as having passed into the storage compartment. Such activity may be sensed through sensors similar to those previously discussed positioned adjacent to the outlet 50 of the transport. This is schematically represented by sensors 182 shown in Figure 26.

After moving the check into the document storage compartment the terminal processor operates the translation mechanism 94 associated with the deposit holding module to tamp the documents in storage. This is accomplished as indicated by the fortieth step by moving the tamping member 96 downward. This serves to assure that the documents in storage are compacted to the extent possible and assures that a larger number of documents may be accepted before the need for removal of documents from the storage compartment.

In some embodiments, the terminal may operate in accordance with its programmed instructions to provide the user with an output asking if they have further checks to deposit. The user may respond with at least one input, and if so a portion of the transaction sequence can be repeated beginning with step 2 in the transaction sequence for example, to accept another check or other document. In such situations the value of the further check or other document may be added to the value of the prior items. In some embodiments items which are deposited may have different properties. For example, in some embodiments the machine may accept items that do not include magnetic coding. Such items may include other features such as verification codes, symbols or characters that are a function of other values or indicia on the items. Such items may include for example vouchers issued by the machine for a difference between an amount the user

was entitled to receive and the value of cash dispensed that could not be dispensed in prior transactions. The machine in such embodiments is operative responsive to its programming to adjust the verification sequence to suit the particular document type being received. The particular document type being received may be based on the at least one input to the machine in the second step, indicia read from the document type, and/or other inputs or data.

In embodiments where a plurality of types of documents are accepted, the machine may operate in accordance with its programming to conduct an analysis of the indicia on the document that is appropriate to verify the particular document type. The document storage module may also include compartments for each type of item that is to be accepted. In this way different item types may be segregated to facilitate removal and sorting.

In embodiments of the invention the receipt of successive documents from one user may continue for a plurality of checks, vouchers or other type items. If the items are verifiable as genuine by the machine and redeemable for cash or credit, the machine may operate to aggregate the value of all such items. The transaction sequence may continue to repeat based on instructions and inputs to the machine in the transaction sequence. It should be understood that for purposes of the exemplary transaction sequence there has been only one item deposited, and only one exemplary type analysis of a document which is a check has been described.

As indicated in the forty-first step if the customer has requested a deposit only transaction during the transaction selection step, the terminal processor causes the machine to go to the forty-fifth step in the transaction sequence. However if the customer has requested to dispense cash based on the value of a cashed check, the logic moves to the forty-second step. If the dispense transaction has been authorized, the terminal processor operates the cash dispenser to dispense an

amount of cash. In some embodiments the amount of cash which may be dispensed may correspond exactly to the amount of the check (less transaction fees in some cases) that has been presented by the customer. This may be done for example in an ATM which includes coin dispensing capability. However in many embodiments of the invention the ATM may be capable of dispensing only certain denominations of currency. This may preclude the customer from receiving the exact amount of change to which they are entitled.

In circumstances where the customer cannot receive exact change the computer may operate to cause a voucher to be printed for the customer. The voucher may include for example a printed coupon or other item that can be redeemed for the amount of the change. This may include for example a coupon redeemable with a merchant for cash and/or services or merchandise. The user may be prompted through operation of the computer to provide at least one input which serves to select from several possible merchants from whom available vouchers are redeemable and in response to the user making a selection of a merchant the voucher is printed with the corresponding merchant name and amount. The system may then operate to provide a credit to the account of the merchant for the amount of the voucher. Such a voucher may include an image of the user for purposes of verification that the person presenting the item is the authorized person.

Alternatively the computer may operate to print and provide a check or other type negotiable instrument to the user. This negotiable instrument may be cashed like a check at the machine or at another location by the user. Such an instrument may be input by the customer to the machine in a subsequent transaction. For example the machine may operate in the subsequent transaction as previously discussed to accept several checks including the negotiable

instrument previously dispensed. The user may elect to cash the amount of these checks or have them credited to an account.

The machine may include among its transaction function devices check or voucher printer devices. These printer devices may be supplied with a stock of check media with magnetic coding that may be similar to other types of checks. The coding may correspond to the account of the operator of the machine or other entity whose account is to be charged for the amount of change received by a machine user. In such embodiments the check is completed by a printing device with the amount of change for which the check may be redeemed. The check may be printed by the machine with the user's name as payee based on the transaction data received, or alternatively made out to cash. Images of the user may be printed on the check for authorization purposes as previously discussed.

The check once completed with the appropriate data and/or images may be dispensed from the machine to the user. The user may cash the check at the machine on the current session or in a subsequent transaction session, or at another location that accepts checks. In some embodiments the check stock provided in the machine may prominently display a statement of maximum value above which a check would not be valid. This may be for example, the smallest denomination currency bill dispensed by the machine. For example if the lowest denomination bill that the machine dispenses is a one dollar bill, the value of change would always be generally less than one dollar, and the statement of maximum value of one dollar which would conspicuously indicate to anyone redeeming the check that if it is above this amount it has been tampered with. Of course the maximum amount may vary depending on the machine and its capabilities. Also having such limited value checks in the machine reduces the risk to the

machine operator in the event the machine is broken into and the check stock is otherwise stolen.

Alternatively the maximum value statement on the check may in some embodiments be printed by the machine itself.

5 Checks issued by the machine on check stock may include micr coding. Such checks may be verified by the machine in the same manner as other checks. Alternatively the machine may include a transaction function device which provides vouchers, scrip or coupon material that is redeemable for cash, credit, services and/or merchandise. At some embodiments such items, which will be referred to as a voucher for purposes of brevity, may have unique indicia or characteristics that are indicative of authenticity. Such indicia or characteristics may include
10 indicia readable by the machine. Such indicia may include a unique magnetic or visual characters and/or profile which is indicative that the voucher is genuine. Of course, such vouchers may in other embodiments include visible or non-visible indicia including images of the user, which are capable of being read and used to verify the authenticity of the voucher. As previously discussed, when such an item is presented to the machine to be redeemed, the
15 machine adjusts the verification steps in accordance with its programming as appropriate for the particular type of document. This may be based on user inputs, information read from the document, or other data.

In alternative embodiments of the invention, the machine need not use any special media or paper to provide a voucher redeemable for cash (or credit and/or merchandise). In such
20 embodiments a printing device in the machine may print the voucher on non-unique media. This printer used for printing the voucher may be a printer used for printing documents that are not redeemable for cash, such as the receipt printer. This may be accomplished by printing on the

voucher one or more numerical codes and/or characters or symbols that are usable to verify the genuineness of the document. These may include for example numerical codes which are a function of at least one value associated with the transaction. For example the voucher may include verification indicia which is determined through use of an encryption function based on a transaction number, user ID, amount, machine ID, transaction time, other values, images, or combinations thereof.

The voucher including the verification indicia may be presented at the machine (and in some embodiments at other machines or establishments) to be redeemed. In the case of presentation of the item at the machine, the verification indicia may be read with other values from the voucher. Because in this example no magnetic coding is used, the programming of the machine would cause the machine to not reject the voucher for lack of magnetic coding. The machine would operate in accordance with its programming to determine the validity of the verification indicia. This would be done using the particular appropriate algorithms and data. This may include for example recovering data from one or more data stores. Such a data store may include for example, data concerning whether a voucher corresponding to the one presented has been previously redeemed. For example the machine may operate to store in one or more data stores when the voucher is issued, data indicative that the voucher has been issued. Such data may include data about the amount, the user, the verification indicia or other data. Then when the voucher is redeemed, either at a machine (the same machine that issued the voucher or another machine) or at another location such as a merchant location, further data is stored to indicate the voucher has been redeemed. Such procedures may help assure that reproductions of vouchers are not redeemed for cash. If the voucher is verified as genuine it is accepted for cash

value in the manner previously discussed. Of course these approaches are merely exemplary and other approaches may be used.

5 Alternative embodiments of the invention may also provide other ways for the user to take or receive the benefit of an undispensed amount. This may include for example the user returning the change to an account with an institution. Alternatively the user may choose to apply the change to the amount of an existing credit card balance or loan that is held by the institution. In addition or in the alternative, the user may apply the undispensed amount to a particular charitable organization. The operator of the machine may track such donations over the year and send the user a statement for tax purposes. In addition the information may be used by the charities to provide such tax documents directly, and/or to solicit further donations from the particular user. This is accomplished in an exemplary embodiment by the machine providing the user with one or more options through output devices, and the user providing one or more inputs through input devices to select one or more of the options for application of the difference. Numerous options may be provided by the user in response to the programming associated with the terminal processor and other connected computers.

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As indicated at the forty fourth step in the sequence the terminal processor operates to cause a receipt to be printed for the user indicating the amount of the cash dispensed. This receipt may also include other information including the amount of change that the user received and an indication of how the value associated with this change was either applied or provided to the user. Of course as previously discussed, in this printing step the terminal processor may also operate to print vouchers, coupons, negotiable instruments or other items that the user has requested to receive.

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As indicated at the forty fifth step the terminal processor next operates in accordance with its programming to prompt the user on whether they wish to conduct another transaction. For purposes of this example it will be assumed that the user declines another transaction. The terminal processor next operates the machine to close the transaction. This may include for example returning the card to the customer, outputting "thank you" messages or other appropriate steps associated with completing the transaction and/or readying the machine for a next customer.

In the forty seventh step the terminal processor operates to send a completion message to the host. As previously discussed the completion message generally includes data indicative of whether the transaction was successfully carried out. In addition in some embodiments of the invention, the completion message may also include data representative of any change that was due to customer and how the customer chose to apply or receive the amount of change. The confirmation data included in the return message may also include data representative of the issuance of an item and/or the identity of the merchant or other entity to whom a credit is required to be issued in consideration of vouchers or coupons that were dispensed to the customer. The completion data may also include a transaction number or data that can be used to identify or authenticate a check or voucher issued to a user. Likewise the message may include data representative of loans, accounts or charities to whom the customer may have elected to apply their change balance. Other appropriate data indicative of the completion of the transaction may be included. The host computer operates in response to this message to appropriately close the transaction and to apply the funds accordingly and to store data in one or more data stores in operative connection with the host.

As can be appreciated from the foregoing description, the exemplary form of the deposit accepting apparatus and system of the present invention and its methods of operation, provides substantial advantages over prior art systems and methods. The exemplary system reduces the need to manipulate documents. This results in increased reliability by reducing the risk of document jams or other malfunctions. The exemplary embodiment further reduces the need to achieve alignment of the document for purposes of reading or analyzing the data thereon.

Generally as long as the particular document is presented in an appropriate transport direction the data may be analyzed and manipulated so as to achieve authorization of the document. It should be understood that while the exemplary embodiment shown analyzes indicia on only one side of a document, other embodiments may analyze indicia on both sides of documents. This may be accomplished for example by having analysis modules on both sides of the document path. Such arrangements in some embodiments may enable documents to be reliably read and analyzed regardless of orientation.

It should be understood that while the exemplary embodiment of the invention has been described as reading checks and vouchers, other embodiments may be used for reading other document types. Such other document types may include for example statements of charges such as utility bills, credit card bills and other statements of charges. Embodiments of the invention may further be adapted to read other or additional types of coding such as one or two dimensional bar codes, other character sets, alphabets of various languages or other characters. Embodiments of the invention may accept only one type of item, or a plurality of types of items. Further, while the exemplary embodiment accepts envelopes, other embodiments may not accept such items, or may accept other types of items.

It should be understood that the architecture of the computers and software described is exemplary. Other embodiments may use different computer and/or software architectures to accomplish the functions and methods described. Further the one or more computers operating in an automated banking machine may be programmed by reading through operation of one or more appropriate reading devices, machine readable media with instructions that are operative to cause the one or more computers in the machine to carry out one or more of the functions and method steps described. Such machine readable media may include for example one or more CDs, magnetic discs, tapes, hard disk drives, PROMS, memory cards or other suitable types of media.

The exemplary form of the present invention further facilitates transaction processing by being able to verify and analyze document images within the ATM. This may avoid the need to transmit entire document images to a remote location for purposes of analysis. Further the exemplary embodiment enables the application of processing rules which facilitates analyzing required data and moving forward with transactions only when such data is read with a sufficient level of assurance that the data has been read accurately.

A further advantage of the exemplary embodiment of the present invention is the ability of a single mechanism to reliably handle both sheet type materials and envelopes. This avoids the need to include multiple depositories within a machine. In addition the exemplary form of the present invention also produces data representative of graphic images of items that have been placed into the depository. Images may be analyzed at the machine or forwarded to another device for verification purposes. Embodiments may be used to conduct payor and/or payee signature analysis including analysis for the presence of signatures and/or for the genuineness of cursive signatures.

Another advantage of the exemplary embodiment is that items placed in the deposit accepting apparatus may be read through imaging or other methods and then returned to the customer. These may include items such as driver's licenses, identification cards, passports or other articles that generally will not be retained within the machine. The exemplary depository also has the capability of receiving documents, reading and/or capturing images and printing on them for purposes of authentication or cancellation and then returning them to the customer. This may prove advantageous for example in the case of customer bills or payments where the customer is provided with a marking on the particular bill to indicate that payment has been made. In addition the exemplary form of the present invention may handle numerous different types of items and documents in this manner. For example embodiments of the invention may be used in applications such as issuing items such as drivers licenses, license plate stickers, gaming materials, and other items. Embodiments of the invention may be used for redeeming items and issuing new or replacement items. Further advantages of the present invention will be apparent, and those having skill in the relevant art may apply the principles of the claimed invention to numerous embodiments.

Thus the deposit accepting apparatus and system for automated banking machines of the present invention achieves at least one of the above stated objectives, eliminates difficulties encountered in the use of prior devices and systems, and attains the useful results described herein.

In the foregoing description certain terms have been described as exemplary embodiments for purposes of brevity, clarity and understanding. However no unnecessary limitations are to be implied therefrom because such terms are used for descriptive purposes and are intended to be

broadly construed. Moreover the descriptions and illustrations herein are by way of examples and the invention is not limited to the features shown or described.

Further, in the following claims any feature described as a means for performing a function shall be construed as encompassing any means known to those skilled in the art as being capable of carrying out the recited function, and shall not be deemed limited to the particular means shown or described for performing the recited function in the foregoing description, or mere equivalents thereof.

Having described the features, discoveries and principles of the invention, the manner in which it is constructed and operated, any of the advantages and useful results attained; the new and useful structures, devices, elements, arrangements, parts, combinations, systems, equipment, operations, methods, processes and relationships are set forth in the appended claims.